AIR FRANCE VIRTUAL AIRLINES

BOEING 737
AIRCRAFT OPERATING MANUAL

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WELCOME

Welcome to the Air France Virtual Airlines Aircraft Operating Manual for the Boeing 737 series aircraft.

This manual is based on the official AFVA Fleet Installer airplane. We are always seeking to improve the accuracy of this manual, and if you have any comments, questions about the airplane, this manual, or aviation in general, please create a help desk issue at www.afva.net with as much detail as you can provide, and we will do our best to answer your questions.

It is beyond the scope of this manual to detail each variant of the Boeing 737 series aircraft. We have therefore chosen to focus on the -700 model and all dimensions and figures are representative of that model.

Aircraft History

The year was 1958 when the Boeing Company started looking for a twin engine jet for use as a feeder airliner to complete its family of passenger service jet aircraft. Boeing had gotten a late start on the project with the Caravelle, BAC One-Eleven, and Douglas's DC-9 already in full production. The Caravelle had already been in service for a full 5 years, the DC-9 was about to fly, and the One-Eleven was well into its test flight stages.

Lufthansa Airlines, the 737 launch customer, placed the first order in February of 1965, and design work began in November of 1966. The original design called for a capacity of between 60-65 passengers and a range of between 100 and 1,000 miles. After discussing the design with Lufthansa, it was determined that the passenger capacity would be increased to 100 passengers, but the range would be left unchanged.

With the market for this type already booming, Boeing needed to come up with something different to remain competitive. One feature was the concept of wing mounted engines, which offered several advantages over the traditional "T-tail" design, such as better center of gravity position and increased space in the rear of the cabin. Wing mounted engines also allowed for easier maintenance and reduced the requirements for materials such as fuel and bleed air lines, electrical wiring, etc. Overall, the concept successfully reduced the gross weight by 1,550 lbs over its T-tail counterpart.

Other advantages can be traced back to previous models of the Boeing family of airliners. The 737 shared a 60% parts commonality with the 727, such as doors, nacelles, wing leading edge devices, cockpit layout, avionics, and other parts. The 727 in turn had parts commonality with the 707, and therefore parts of the 737 can be traced back as early as the early 1950's. Commonality enabled Boeing to reduce the cost of manufacture, and reduced total cost of ownership by reducing overhead in parts and maintenance costs to the customer, especially customers who already operated the 707 and 727.

The first order by Lufthansa was received by Boeing on 15 April 1965, was rolled out of the hangar on 17 January 1967 and completed its first test flight on 9 April of the same year. The aircraft received its certificate of operation on 15 December 1967, was delivered to Lufthansa just two weeks later on 28 December, and placed into regular service on 10 February 1968.

The first model, the -100, ended up seeing the least number of sales. With a stretched fuselage, the -200 was born and sold hundreds throughout the rest of the 1960's and '70's. Boeing laid the groundwork for its Next Generation (NG) family of 737's with the -300 and -400 models in the mid 1980's, with SNECMA CFM56 turbofan engines replacing the original Pratt & Whitney JT8D's that powered the 737-100 and -200.

The Next Generation 737 series started with the -600 model and was built on a series of successes from its earlier predecessors, incorporating advancements and improvements on reliability, simplicity, and further reducing maintenance and operating costs and passing the savings on to the customers. The -600 saw the introduction of the CFM56-7 turbofan engine among other upgrades in the avionics suite and other systems.

Today the Next Generation subfamily includes the -600, -700, -800, and -900 models. The -700 began with its launch customer, Southwest Airlines. Rolling out of the production hangar on 7 December 1996, the -700 received approval and certification by the U.S. Federal Aviation Administration (FAA) in November of 1997 and a month later was placed into service flying under the call sign "Cactus".

At the time of writing, Air France/KLM has 48 Boeing 737 aircraft in operation, and are broken down into the following variants:

737-300 – 7 aircraft
737-400 – 9 aircraft
737-700 – 6 aircraft
737-800 – 21 aircraft
737-900 – 5 aircraft

Powerplant

The Boeing 737 aircraft family saw several different engine models provided by two different companies – Pratt & Whitney's JT8D engines gave life to the early -100 and -200 models, as well as the 727 and the Douglas DC-9 while the later 737 models were outfitted with the quieter and more efficient SNECMA CFM56 turbofans.

Pratt & Whitney JT8D

The JT8D is a classic early turbofan engine. It powered some of the most successful first generation medium range airliners such as the 727, DC-9, and the 737 (-100/200). More than 1,400 of these engines were built and installed on over 4,500 aircraft accumulating better than a half billion hours of service since 1964.

The original JT8D engine was rated from 14,000 and 17,000 pounds of thrust. In 1966 the FAA gave Pratt & Whitney its seal of approval for the more powerful JT8D-200 model which offered between 18,500 and 21,700 pounds of thrust. This upgraded engine is the exclusive powerhouse behind the McDonnell Douglas MD-80 series, and was also included in Boeing 707 refits.

SNECMA CFM56

The ongoing rivalry between Boeing with its 737 series, and Airbus Industrie with its A320 series, continues to dominate the market of medium range twin engine airliners. While each offers a variety of different options to customers, where they share commonality is in a top-of-the-line choice of engines. While some Airbus A320 aircraft use another engine, both A320 and 737 use variants of the CFM56 turbofan.

The CFM56 comes in 6 different models starting out at 18,500 pounds of thrust and topping out at 34,000 pounds. The CFM56 was first developed as a replacement engine for the United States Air Force KC-135 refueling tanker and E-3 Sentry, both modified versions of the Boeing 707, which had been using the aging Pratt & Whitney JT3D engines. Now, more than 7,000 CFM56 engines are installed on Boeing 737 variants, from the -300 onward. More than 2,400 CFM56 engines are powering Airbus's A319, A320, and A321 models.

The CFM56 provides exceptional reliability and allowed the 737 to be the first in its class to be fully certified for 180-minute ETOPS operations.

The CFM56 is not solely found on twin engine aircraft. When the Douglas Company made the decision to refit its DC-8 "Sixty Series" as part of the "Seventy Series"conversion, the company turned to SNECMA and chose the CFM56-2C. Additionally, the CFM56-5C is found on the Airbus A340, a 4 engine long range airliner.

With such a wide range of aircraft operating variants of the CFM56 engine, SNECMA has estimated that a CFM56 powered airplane takes off every 5 seconds somewhere in the world.

TAKEOFF CONDITIONS						
CFM56 Model	-7B18	-7B20	-7B22	-7B24	-7B26	-7B27
MAX T/O Thrust	19,500	20,600	22,700	24,200	26,300	27,300
Airflow Lb/sec	677	696	728	751	779	782
In-Flight Performance (FL350, Mach 0.78)						
MAX Climb Thrust	5,962	5,962	5,962	5,962	5,962	5,962
MAX Cruise Thrust	5,450	5,450	5,450	5,480	5,480	5,480
Engine Characteristics						
Length (in)	98.7	98.7	98.7	98.7	98.7	98.7
Fan Diameter (in)	61.0	61.0	61.0	61.0	61.0	61.0
Basic Dry Wt (Lb)	5,216	5,216	5,216	5,216	5,216	5,216
Airframe Applications						
Boeing NG Series	-600	-600 -700	-600 -700	-700 -800 -900	-700 -800 -900	-800 -900 BBJ

* Thrust values are given in pounds (Lb)

Aircraft Specifications

The table below represents the physical characteristics of the 737-700 aircraft. Rather than detail all aspects of each 737 variant, the data below represents a sample regarding the 737 series aircraft.

BASIC DIMENSIONS		
Length	105 feet 7 inches	32.18 meters
Cabin Width	12 feet 4 inches	3.76 meters
Height	41 feet 3 inches	12.57 meters
Wheelbase	41 feet 4 inches	12.60 meters
Wingspan	112 feet 7 inches	34.31 meters
WEIGHT AND LOADING		
MAX Taxi Weight	133,500 Lbs	60,554 Kg
MAX Takeoff Weight	133,000	60,328
MAX Landing Weight	128,000	58,060
MAX Zero Fuel Weight (MZFW)	120,500	54,658
Empty Operating Weight (EOW)	83,000	37,648
OPERATING LIMITATIONS		
Service Ceiling	41,000 Ft MSL / FL410	
Seating Capacity	126 (Two Class Config)	149 (Economy Config)
MAX Cargo Capacity	966 ft^3	27.3 m^3
Useable Fuel Volume	6,875 Imperial Gallons	26,022 Litres
Useable Fuel Weight	46,063 Lbs	20,894 Kg

Fuel Loading

The 737 has three fuel tanks; one tank in each wing (Left Main and Right Main), and a centerline Center Main tank. Both the left and right main tanks have a capacity of 8,626 Lbs, and the center main tank has a capacity of 28,800 Lbs. Due to the pickup point in the fuel tanks, some of the fuel is unusable. The total amount of useable fuel in the 737-700 is 46,063 pounds, or 20,894 kilograms. A fully fueled 737-700 aircraft is capable of flying more than 3,000 nautical miles, or more than 6,000 kilometers. It is important to note, however, that high cargo/passenger loads will reduce the amount of fuel that can be loaded because of the maximum gross weight. Higher cargo loads resulting in less fuel carried onboard will negatively impact the aircraft's range. It is also important to mention that fuel is heavy, and excessive loads of fuel result in decreased performance such as higher than normal drag and N_1 settings during all phases of flight.

The data in the table below is compiled from an average flight at Amsterdam Schipol Airport. The in-flight performance data will help you by providing valuable information for fuel planning purposes. The flight that produced these results was conducted with a full fuel load and near the maximum takeoff weight. Varying the fuel load will produce different results, but this data should provide you with a general baseline for fuel consumption.

Air France Virtual Airlines recommends using the fuel loading feature of the Aircraft Communication and Addressing System (ACARS).

Altitude	Speed	N_1	Fuel Flow (Lbs/Hr)
TAKEOFF	N/A	89.0%	8,800
FL100 (Cruise)	250 KIAS	73.0%	3,910
FL180 (Climbing)	M 0.63	92.0%	5,600
FL250 (Climbing)	M 0.63	90.6%	3,930
FL300 (Climbing)	M 0.63	91.3%	3,300
FL330 (Cruise)	M 0.78	82.1%	2,860
FL350 (Cruise)	M 0.78	80.3%	2,420

It is Air France Virtual Airlines policy to require pilots to carry onboard the minimum fuel required for the flight, plus a 45-minute fuel reserve for low altitude cruise (FL100). Pilots are solely responsible for ensuring that aircraft are operated within all design envelope parameters.

Again, it is the recommendation of Air France Virtual Airlines to use the ACARS fuel planning utility to plan and load fuel on your aircraft.

It is the Captain's responsibility to ensure that there is enough legal fuel for the flight. Any incident that is the result of poor fuel planning will always be the fault and failure of the Captain and crew. When in doubt, take more.

Recommended Equipment

Air France Virtual Airlines provides 32-bit Fleet Installer utilities located in the Fleet Library, which is accessible from the Pilot Centre. The Boeing 737 installer utility is currently compatible with Flight Simulator 2002, 2004, and FSX. However, there are many other models available at flight simulation resource websites such as www.avsim.com, or www.flightsim.com, just to name a few.

We are committed to providing you the best products available. If you find a model that you feel is superior to the ones provided in the installer, please contact a member of the staff and provide us with a copy for testing and evaluation.

Air France Virtual Airlines Standard Operating Procedures

These procedures are designed so that today's crews can work together effectively and safely as well as allowing some standardization of procedures for the company. By standardizing procedures the company can budget flights better financially as flights will always be the same or at least somewhat similar.

For the crews, this means that the company can schedule pilots together that have never flown together before and still maintain a safe operation. For Air France Virtual Airlines, these procedures are for the benefit of the pilots using this manual. By flying using these standard procedures, pilots will be able to make better use of the manual and also operate the aircraft in a similar fashion company wide.

In any circumstance where company procedure conflicts with manufacturer's recommended operation, company procedure will take precedence unless it is a safety of flight issue.

Discretion is the responsibility of the Captain.

Pre Flight

- Ensure that your flight plan is loaded into the GPS or FMS, with the proper waypoints. You can find charts and navigation information on the Delta Virtual Airlines website under the Pilot Centre.
- Calculate your proper fuel load for the trip. Don't forget reserves, as well as a 1,250 lb allowance for taxiing.
- Ensure that you have proper approach charts for both takeoff and approach airports. When there is the possibility of poor weather at your destination you should also obtain charts for alternate airports. These charts should be available at the Air France Virtual Airlines web site.
- Ensure that the local airport VOR frequency has been dialed into the DME2 radio. Always assume that you will need to abort the flight *after* V_1 – that means getting the aircraft off the ground and returning to the original airport. You don't want to be fumbling through charts and the radio stack in such a situation!
- If flying online, ensure your flight plan has been filed and approved by the clearance delivery controller for your departure airport.
- Obtain tower clearance for engine startup, pushback and taxi.

Gate Departure

- Close doors 5 minutes prior to scheduled departure time.
- Make departure announcement: "Ladies and gentlemen, on behalf of the crew, this is your (*captain/first officer*) (*insert name*), welcoming you aboard Air France Virtual Airlines flight (*flight number*) with service to (*destination*). Our flight time today will be approximately (*time en route*) to (*destination*). At this time, I'd like to direct your attention to your to the monitors in the aisles for an important safety announcement. Once again, thank you for choosing Air France Virtual Airlines. Flight attendants, prepare doors for departure and crosscheck."
- Contact the ramp controller, obtain pushback clearance and push back. ***Power back or reverse taxi operations are prohibited in the 737.***
- Complete before and after engine start checklists.
- Complete taxi checklist and obtain taxi clearance.
- Check flight controls for binding. (Rudder, Elevator and Ailerons)
- Once clear of the gate area, set flaps for takeoff.

Takeoff

- Complete takeoff checklist.
- Set auto-brake to RTO.
- Advance throttles to stabilize the engines. Set N_1 to 89% thrust.
- Accelerate to V_1. (Captain's hand must remain on the throttle until V_2.)
- At V_R, smoothly rotate the nose of the aircraft to 10° nose up. **Rotating more than 10° may cause a tail strike.**
- When a positive rate of climb has been established and above 100 feet AGL, Landing Gear UP.
- Accelerate to V_2, raising the flaps on schedule.

Climb

- With flaps 1 selected, set N_1 to no more than 90% and climb out. Vertical pitch must be adjusted to maintain airspeed when climbing.
- At 3,000 feet AGL, select autopilot CMD.
- Complete climb checklist.
- Accelerate to 250 KIAS until 10,000 feet MSL (FL100) where you may accelerate to enroute speed.
- AT 10,000 feet MSL (FL100), inform cabin crew that use of approved electronic devices is authorized. Standard notification is 2 chimes on the No Smoking sign.
- At 18,000 feet MSL (FL180), reset altimeters to standard pressure of 1013 HpA, or 29.92 inHg.
- Climb to cruise altitude, adjusting pitch so as not to exceed V_{MO}.

Cruise

- Set auto throttle to normal cruise speed of Mach 0.72 to 0.78.
- Make cabin announcement: "Ladies and gentlemen, this is your (*Captain/First Officer*) speaking. We've reached our cruising altitude of (xxx thousand feet). We should be approximately (*time*) enroute and expect to have you at the gate on time. I've turned off the fasten seatbelt sign, however, we ask that while in your seat you keep your safety belt loosely fastened as turbulence is often unpredicted. Please let us know if there is anything we can do to make your flight more comfortable, so sit back and enjoy your flight."
- Monitor flight progress, fuel consumption, and engine performance.
- Review meteorological data for destination.

Descent in Range

- Review the STAR/Runway charts and brief the crew on the approach.
- Complete descent checklist.
- At FL180, set altimeters for the destination airport.
- Throttle back to 250 KIAS below 15,000 feet MSL, 240 KIAS below 12,000 feet MSL.
- Below 10,000 feet MSL landing lights ON, safety belt signs ON.
- Review IAP/ILS charts.

Approach

- Complete approach checklist.
- Once past the last navigation aid, tune ILS frequency into NAV1 radio.
- Intercept the glide slope at 190 KIAS, slow the aircraft to 160 KIAS on the glide slope.
- At 10 miles out, arm ground spoilers and auto brake.
- Once established on the localizer, enter missed approach altitude and heading into the autopilot.
- When glide slope is one dot above, or 8 miles from the runway threshold, whichever is first, select landing gear DOWN.
- Once airport is acquired visually, slow the aircraft to 135 KIAS selecting full flaps.
- Complete landing checklist before 3 miles from the threshold.

Landing

- After touchdown, select full reverse thrust. Brake as required to slow the aircraft. (See expanded checklist.)
- At 80 KIAS or when sure of stopping distance, disengage thrust reverse, lower spoilers and taxi clear of the runway. *Reverse thrust is ineffective below 80 KIAS.*
- Make announcement: "On behalf of Air France Virtual Airlines and your entire flight crew we'd like to welcome you to (*destination*) where the local time is (*time*). We hope you've enjoyed your flight with us today and hope that the next time your plans call for air travel, you'll choose us again. Once again, thank you for flying Air France Virtual Airlines. Flight Attendants, prepare doors for arrival and crosscheck."

Taxi to Terminal

- Once the runway has been vacated, landing lights OFF, taxi lights ON.
- Retract flaps.
- Autopilot OFF.
- Obtain taxi clearance and gate assignment.

Securing the Aircraft

- Parking brake SET.
- Taxi lights OFF.
- Select engine fuel flow CUTOFF.
- Seat belt signs OFF.
- Once engines have spooled down, all navigation and strobe lights OFF.

Crew Duties

This subsection describes the normal division of duties among flight crewmembers, and is implemented to ensure that maximum crew efficiency and management is maintained.

Captain (Pilot-in-Command)

The Pilot in Command of the aircraft shall be designated CAPTAIN and has authority over all assigned crewmembers in accordance with Federal Aviation Regulations (FAR) §121.533 and §121.535 throughout flight duty time. His/her orders are to receive prompt compliance even though at times the order may be in variance with established procedures. It is, however, the responsibility of all crewmembers to bring to the Captain's attention any information and/or factors, the importance of which may have direct bearing and influence on his/her decisions where the safety of the flight is involved. The Captain has the ultimate responsibility for safe operation of the aircraft, crew management, coordination and awareness, passenger comfort and maintenance of schedule. Additionally the Captain will have all required charts and approach plates available.

First Officer

The First Officer is second in command of the aircraft and will assume the responsibilities of the Captain should he or she become incapacitated in any way throughout the duration of the flight. At the originating stations, the First Officer will proceed to the aircraft as soon as possible, perform pre-flight inspections and ensure the aircraft is properly serviced and fuelled, obtain weather reports, applicable NOTAMS, calculate performance data and maintain navigation log. The First Officer will have all required charts and approach plates available and assist in navigational duties and radio operation. Additionally, at the direction of the Captain, the First Officer will assist in flight planning operations.

Words from the Chief Pilot

Unlike many other aircraft, especially in the same class, the 737 is very pilot-friendly and forgiving. The aircraft has had many upgrades since the first models rolled out of the hangar in the late 1960s. Some of these upgrades include the relatively new "glass cockpit". All of the old analog gauges have been replaced by a series of MFDs (Multi Function Displays) and a HUD (Heads Up Display). The HUD displays critical information to the pilot and reducing the need to look down, especially important in critical stages of flight such as takeoff and landing.

The aircraft does have a larger turn radius both in the air and on the ground due to the increased size, as compared to the early 737s. The aircraft is extremely stable in flight and is very maneuverable.

One drawback to the 737, as with many other aircraft, is the flaps. I have found the flaps very easy to over speed. Over speeding the flaps is very serious, as it increases the air load on the wing surface beyond its specified parameters and causes potential stress weaknesses in the airframe. Once an aircraft has over speeded the flaps, an exhaustive inspection must be completed which may take the aircraft out of service for a considerable amount of time. If you are careful and attentive, you will be fine. Just remember to pay attention to your indicated airspeed.

Hard landings are normally a serious problem with heavier aircraft. It is just as important to reduce the number of hard landings in the 737 although you will not get the same results from a "semi-hard" landing in the 737-700 as you would in a Boeing 777. A 737-700 is more likely to skip off the runway on a hard touchdown rather than dig in like a heavier jet would.

Another very important note regarding hard landing is to be very cautious with nose touchdowns. In the 737-700, the space between the main landing gear and nose landing gear is 41' 4" (12.60m), although this wheelbase is slightly shorter than that of the -800 and -900 models. Regardless of model, this large wheelbase makes a hard nose touchdown a very dangerous event as the forward fuselage may endure, or *not* endure the very high stress factors placed on it.

This picture is an example of the stress that may be caused by hard nose gear touchdowns:

As the costs of maintenance and wages increase, most airlines these days are constantly looking for ways to save money and conserve resources. One of the most successful attempts was the design of a cross-platform family of aircraft. Boeing's own 757 and 767 are prime examples. These aircraft were designed with near identical cockpit layouts, gauges and other equipment making it possible for a pilot qualified to fly one to be equally qualified on the other. The 737 is no different. A pilot who is checked out in any variant of the 737, ranging all the way from the nostalgic -100 model may be easily certified all the way up the line to new latest -900 series. Of course, with recent upgrades a familiarization and final checkout is required. By this approach the operating airlines are afforded more flexibility in crew tasking and route planning, in turn saving money.

It is important to point out that some of the items contained in the checklists above will not apply to all variants of the 737. The checklists were designed for "cross-platform" use. Air France Virtual Airlines operates 737-300, -400, -600, -700, -800, as well as the -900 series of aircraft in its fleet.

Many pilots' 737 flying experience will begin in the 737-400. The aircraft is notably smaller and has some very different characteristics that should be pointed out. As mentioned above, the turn radius is smaller in the 737-400 compared to the 737-700. Ground handling is very important as it can easily ruin what began as a routine day. There's no other kind of embarrassment for a pilot than to show poor ground handling skills.

There are differences to note in the air as well. The smaller 737 models tend to be easier to over speed than the larger ones due to smaller fuselage cross sections and less drag. Be mindful of your speed in this aircraft! With shorter wingspans, you will notice more maneuverability in earlier models. If you plan to frequently interchange use of the different models, take a few minutes to do some "circuits". Remember, there's not much room for error when you're at 37,000 feet so safety should be your primary concern.

This is a very enjoyable and rewarding aircraft to fly. Always remember to stay vigilant and aware and you'll be just fine. Enjoy the skies and happy landings!

Aircraft Checklists

The following section lists actual checklists for the Boeing 737-800 aircraft. Although the simulated aircraft may not have the same level of detail is its real-world counterpart, these checklists are provided to give Air France Virtual Airlines pilots a glimpse at real-world operations in the 737-700.

Cockpit Safety Inspection

The flight deck safety inspection will be accomplished when an originating flight crew arrives or during crew change if electrical power is not applied to the aircraft.

Hydraulic Pumps ..... SET
Landing Gear Lever ..... DOWN
Flap Lever ..... WITH OBSERVED SURFACE POSITION

- If lever agrees with flap position, set to corresponding position.
- If flaps are clear, retract when hydraulic power is available.

Air Conditioning Supply Switches ..... OFF

Preliminary Cockpit Preparation

Electrical Power ..... ESTABLISH

If APU is to be used, start APU in accordance with procedure.

Battery Switch ..... ON

Check that minimum 26V DC is available

External Power ..... ON
STBY Power ..... AUTO
Galley Power ..... ON
Bus Transfer Switch ..... AUTO
Air Conditioning ..... SET

Ground air conditioning should be used whenever available.

Isolation Valve ..... OPEN
Recirculation Fan Switch ..... AUTO
APU Bleed Switch ..... OFF
Engine 1 & 2 Bleed Switches ..... ON
Fuel System ..... CHECK
Cross-feed Switch ..... CHECK

Place cross-feed switch to OPEN.

Light illuminates BRIGHT indicating valve is in transit, reverts to DIM indicating valve is OPEN.

Place cross-feed switch to CLOSE.

Hydraulic System ..... CHECK
Electric Pump Switches .....OFF
Engine Pump Switches ..... OFF
Hydraulic Fluid Quantity ..... CHECK
Anti-Skid System .....TEST
Anti-Skid Switch ..... ARM
Anti-Skid Switch ..... OFF
Flight Deck Equipment ..... CHECK

- Smoke Goggles
- Life Vests
- Walk-Around Oxygen Bottles
- Escape Lines
- PA system
- Hand Axe
- Gear Pins
- Fire Extinguisher
- Emergency Medical Kit
- Normal/Emergency Checklist

Cabin Interior Inspection

It is the duty of the Flight Attendants to inspect all emergency equipment and reporting to the Senior Flight Attendant. The Senior Flight Attendant will report any discrepancies to the Captain prior to gate departure.

Exterior Walk-Around (First Officer)

At originating stations the First Officer will perform a visual general condition check of the aircraft exterior for visible damage, leaks of fuel and oil and the following areas:

- Fixed masts such as pitot tubes, radio antennas and Angle of Attack sensors
- Engine cowling, pylons, and inlet and exhaust areas
- Wing leading edges, tips and trailing edges
- Flight control surfaces
- Landing gear and tires
- Brake wear indicator pins for extension
- Verify fuel loads by gauges and dripless sticks

If any maintenance is being performed, the First Officer will check with the lead technician on the progress of the work and possible limitations such maintenance actions may cause such as power application and/or flight control movement.

During cold weather operation, the First Officer should be particularly alert for:

Damage to aircraft from flying slush/water
Ice formation on any or around flight control surfaces or actuators which may limit full range of travel
Blockage of vent holes, pitot trobes or static ports by ice, snow, or other debris
Ice formation around wing to fuselage and tail to fuselage fillet areas
Engine inlets, cowlings and reversers

WARNING: Takeoff is NOT permitted with frost, snow, slush, or ice adhering to the wings, vertical/horizontal stabilizer or flight control surfaces.

External Power Receptacles ..... OPEN/WHEEL WELL LIGHTS ON
Radome Fasteners ..... LOCKED
Left, Right and Centre Pitot Masts ..... CHECK CONDITION
Nose Gear Strut ..... CHECK INFLATION/LEAKAGE

- Normal strut extension is 2-6 inches.

Nose Gear Lock Pin ..... REMOVED
Electronics Bay Access Door ..... CLOSED/LATCHED
Antennas ..... CHECK CONDITION
Stall Warning Vane ..... CHECK CONDITION
Wing Leading edge Flood Light ..... CHECK CONDITION
Hydraulic Reservoir ..... CHECKED
Hydraulic Filters ..... CHECKED
Brake System Accumulators ..... CHECKED
Fuelling Panel Door ..... CLOSED/LATCHED
Fuel Vent ..... NO OBSTRUCTIONS
Wing Tip Lights ..... CHECK CONDITION
Landing Light ..... CHECK CONDITION/RETRACTED
Anti-Collision Lights ..... CHECK CONDITION
Aileron ..... DIRECTION OF TRAVEL
Aileron Tabs ..... CHECK CONDITION (NO LOOSNESS)
Spoiler Panels ..... DOWN/FAIRED
Over-wing Emergency Exits ..... INSTALLED/RED RELEASE FLUSH
Right Main Gear Wheels and Tires ..... CHECK CONDITION/INFLATION/CLEAN
Brakes ..... CHECK CONDITION/LEAKAGE/WEAR INDICATORS (BRAKES SET)
Right Main Strut ..... CHECK INFLATION/LEAKAGE

- Normal strut extension is 1 ½ to 4 inches.

Hydraulic Lines/Electrical Conduit ..... CHECK CONDITION/LEAKAGE
Nacelle Inspection Doors ..... CLOSED/LATCHED
Rudder and Tab ..... CHECK CONDITION
Horizontal Stabilizer ..... CHECK CONDITION
Toilet Service Door ..... CLOSED/LEAKAGE
Cabin Pressure Outlet ..... FREEDOM OF MOVEMENT/OPEN
Radio Rack Venturi Outlet ..... OPEN
Over-wing Emergency Exits ..... INSTALLED/RED RELEASE FLUSH OPEN
Cabin Pressure Regulator Safety Valve ..... CLOSED
External Power Receptacle ..... EXTENGUISH LIGHTS/SECURE DOOR

Final Cockpit Preparation

Flight Recorder ..... ON, CHECKED & SET
- Check tape. If 10 or fewer hours remain, record in maintenance log.

Circuit Breakers ..... CHECK
- All circuit breakers should be closed unless otherwise required by maintenance personnel or as documented in the maintenance log.

Voice Recorder ..... ON & TESTED
- Hold TEST switch in for at least 5 seconds and observe Monitor Meter needle indicates in green band.

Exterior Lights ..... OFF
- Check that wing and runway turnoff lights are OFF.

Electrical Panel .....CHECKED
Cabin Emergency Lights Switch ..... ARMED
Seat Belt/No Smoking Signs Switch ..... ON
Ice Protection Panel ..... CHECKED
Wing Body Overheat .....TEST/OFF
Window Heat ..... ON
Engine Cowling and Wing Anti-Ice ..... OFF
- **Do not use Engine Cowling/Wing Anti-Ice above 10˚C.**

Air Conditioning Controls ..... SET
Cabin Pressurization Controls ..... SET
GPWS ..... TEST
Reverse Lights ..... TEST
Nose and Wing Landing Lights ..... OFF
Gear Lever ..... DOWN/3 GREEN
Fuel Quantity ..... CHECK
Radios ..... CHECKED & SET
Radar ..... TEST AND STANBY
Transponder ..... STANDBY
Stabilizer Trim ..... CHECKED & SET
Spoiler Lever ..... FORWARD & DISARM
Fuel Control Levers ..... CUTOFF
Throttle Levers ..... IDLE
Autopilot ..... DISARM
Marker Lights ..... TEST
Flight Instruments and Altimeters ..... CHECKED AND SET
Digital Clock ..... SET

Before Engine Start

Cockpit Preparation ..... COMPLETE
Light Test ..... CHECKED
Oxygen and Interphone ..... CHECKED
Yaw Damper ..... ON
Fuel ..... PUMPS ON
Galley Power ..... ON
Emergency Exit Lights ..... ARM
Passenger Signs ..... ON & ON
Window Heat ..... ON
Hydraulics ..... NORMAL
Air Conditioning and Pressure Packs, Bleeds ON ..... SET
Autopilots ..... DISENGAGED
Instruments ..... CROSS-CHECKED
Anti-Skid ..... ON
Auto Brake ..... RTO
Speed Brake ..... DOWN DETENT
Parking Brake ..... SET
Stab Trim Cut-Out Switches ..... NORMAL
Wheel Well Fire Warning ..... CHECKED
Radios, Radar and Transponder ..... SET
Rudder and Aileron Trim ..... FREE AND ZERO
Papers/Charts ..... ABOARD
FMC ..... SET
N_1 and IAS Bugs ..... SET
Doors ..... CLOSED
Start Pressure ..... 35 PSI (MINIMUM)
Anti-Collision Lights ..... ON
Beacon ..... ON

After Engine Start

Electrical ..... GENERATORS ON
Pitot Heat ..... ON
Anti Ice ..... AS REQUIRED
Air Conditioning and Pressure ..... PACKS ON
Recall ..... CHECKED
Start Levers ..... IDLE DETENT

Taxi and Before Takeoff

APU ..... OFF
Flight Controls ..... CHECKED

- This check may be accomplished prior to leaving the gate.
- Check for freedom of movement and ensure no binding or abnormal feelings occur during control surface movements.
- If necessary, signal ground crew to visually verify correct direction of travel of flight control surfaces.

Flaps ..... SET

- Verify flap position indicator agrees with flap selector lever.

Rudder, Aileron and Stabilizer Trim ..... SET
Cabin Door ..... LOCKED
Taxi Lights ..... AS REQUIRED
Takeoff Briefing ..... REVIEWED

Takeoff

Engine Start Switches ..... ON
Lights ..... INBOARD
Auto Throttle ..... ARM
Transponder ..... ON

Climb

Air Conditioning and Pressure ..... CHECKED AND SET
Engine Start Switches ..... OFF
Landing Gear ..... UP AND LOCKED
Flaps ..... UP

- Ensure no caution/warning lights illuminate.

Altimeters ..... SET

- At transition altitude of 18,000 ft MSL, reset altimeters to standard pressure of 1013 mb/29.92 inHg. Below FL180 altimeters should be set to the local altimeter.

Approach

Anti-Ice ..... AS REQUIRED
N_1 and IAS Bugs ..... SET
Instruments ..... CROSS-CHECKED
Approach Briefing ..... REVIEWED
Passenger Signs ..... ON

Landing

Engine Start Switches ..... ON
Master Caution Recall ..... CHECKED
Speed Brake ..... ARM
Flaps ..... SET
Landing Gear ..... DOWN, 3 GREEN
Strobe ..... ON
Landing Lights ..... ON
Runway Turnoff Lights ..... ON

Shutdown

Fuel Pumps ..... OFF
Electrical ..... ON

- External power should be used whenever it is available. APU power is also acceptable. If crew change will take place, leave APU on.

Galley Power ..... AS REQUIRED
Seatbelt Signs ..... OFF
Pitot Heat ..... OFF
Window Heat ..... OFF
Electric Hydraulic Pumps ..... OFF
Air Conditioning and Pressure ..... Packs/Bleeds ON, GND
Anti-Collision Lights ..... OFF
Engine Start Switches ..... OFF
Auto Brake ..... OFF
Speed Brake Lever ..... DOWN DETENT
Flaps ..... UP
Parking Brake ..... SET
Start Levers ..... CUTOFF
WX Radar ..... OFF
Transponder ..... STANDBY

Securing the Aircraft

IRS Mode Selectors ..... OFF
Emergency Exit Lights ..... OFF
Air Conditioning Packs ..... OFF
APU/Ground Power ..... OFF
Battery Switch ..... OFF

Acknowledgements and Legal Stuff

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